INFORMATION SCIENCE IN TRANSITION

Course Code: 9207 **UNITS: 1-9**

SUDY GUIDE

BS-LIBRARY AND INFORMATION SCIENCES

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Department of Library and Information Sciences
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2019

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Course Organization

The course has been designed as easy as possible for distance mode of learning and it will help students in completing his/her required course work. The course is of three credit hours and comprises on nine units, each unit starts with an introduction which provides an overall overview of that particular unit. At the end of every unit the objectives of unit show student the basic learning purposes. The rationale behind these objectives is that after reading unit a student should be able to explain, discuss, compare, and analyze the concepts studied in that particular unit. This study guide specifically structured for students to acquire the skill of self-learning through studying prescribed reading material. Studying all this material is compulsory for successful completion of the course. Recommended readings are listed at the end of each unit. Few self-assessment questions and activities have also been put forth for the students. These questions are meant to facilitate students in understanding and self-assessment that how much they have learned.

For this course, a 3-days workshop at the end of semester, and four tutorial classes/meeting during semester will be arranged by the department for learning this course. The participation/attendance in workshop is compulsory (at least 70%).The tutorial classes/meetings are not formal lectures as given in any formal university. These are meant for group and individual discussion with tutor to facilitate students learning. So, before going to attend a tutorial, prepare yourself to discuss course contents with your tutor (attendance in tutorial classes/meetings is non-compulsory).

After completing the study of first 5 units the 'Assignment No. 1' is due. The second assignment that is 'Assignment No. 2' is due after the completion of next 4 units. These two assignments are to be assessed by the relevant tutor/resource person. Students should be very careful while preparing the assignments because these may also be checked with Turnitin for plagiarism.

Course Study Plan and Chart

As you know the course is offered through distance education so it is organized in a manner to evolve a self-learning process in absence of formal classroom teaching. Although the students can choose their own way of studying the required reading material, but advised to follow the following steps:

Step-1: Thoroughly read description of the course for clear identification of reading material.

Step-2: Read carefully the way the reading material is to be used.

Step-3: Complete the first quick reading of your required study materials.

Step-4: Carefully make the second reading and note down some of the points in note book, which are not clear and needs fully understanding.

Step-5: Carry out the self-assessment questions with the help of study material and tutor guidance.

Step-6: Revise notes. It is quite possible that many of those points which are not clear and understandable previously become clearer during the process of carrying out self-assessment questions.

Step-7: Make a third and final reading of study material. At this stage, it is advised to keep in view the homework (assignments). These are compulsory for the successful completion of course.

Assessment/Evaluation Criteria of Students' Coursework

Multiple criteria have been adopted to assess students' work for this course, which is as follows:

i. Written examination to be assessed by the AIOU Examination Department, at the end of semester= 70% marks (pass marks 50%). AIOU examination rules will be applied in this regard.

ii. Two assignments and/or equivalent to be assessed by the relevant tutor/resource person= 30% marks (pass marks 50% collectively).

Note: *Assignments submission and getting pass marks is compulsory, the student who will not submit assignments or marked as fail considered FAIL in the course. He/she will get fresh admission in the course; there is no need to sit in the exam.*

Course Introduction

The nature of information science, the scope of the discipline and its relations to other academic and professional areas are as old as the discipline itself. Information science first became known as a discipline during the 1950s. The first usage of the term in a paper by Farradane (1955), in which he stated that contemporary British academic and professional qualifications were '*a pattern for establishing qualifications in documentation, or "information science"*', following from earlier uses by Farradane of the term *information scientist*, to mean initially a specialist in the handling of scientific and technical information. The discipline grew out of the longer-standing *documentation* movement, under numerous social, economic and technical influences.

This course with the title '*Information science in transition*' lives up to its title and appearance. Though a superficial glance this term can be applied to an area, which emerged barely fifty to seventy years ago. These are not merely navel-gazing, or arguments about terminology. They relate to the validity and viability of the discipline and have significance for the extent to which its unique contributions are recognized. Nevertheless, all course contents deal with major changes that occurred during this period and face, Janus-like, the past and future of information science. Being active in the field for a long time, the writers of course themselves have participated in major events and stood behind many new ideas, theories, or applied developments. They bring into the discussion not only the literature of different periods, but also their own notes, experiences and impressions of the field. The old names and ideas are resurrected and followed up to present days, proving that the fundamental concepts and principles are not less important than daily pursuits. As for the future, all the authors make clear that there will be no lack of challenges or new information problems; however, there is quite a visible trend in many units/contents to doubt the vitality of information science itself. The same developments in information and communication of our society that have brought the concept of information science into being seem to work against it, because of so many more powerful research communities are involved in this area at present.

The image of information science is built throughout the text by introducing a variety of areas constituting different aspects of the discipline. The course mainly covers the developments in the UK with an occasional glimpse at the USA and some other European countries. The most interesting is the coverage of the information science given in the course material. According

to Meadows, information science covers two main directions (information retrieval and information seeking) and a lesser trend in bibliometrics and communication. The course also includes one article overviewing information seeking as a whole (by Tom Wilson) and several articles devoted to different aspects of knowledge organization and information retrieval; several also cover scholarly communication and bibliometrics topics. Only one is devoted to both national and organizational information policies (by Liz Orna). Thus, softer aspects of information science are represented more modestly in this course in quantitative terms (although not qualitatively). In this study guide the subject information science is covering this wide ground, which is pulled together by some fundamental concepts. This course adds some value to already valuable material reflecting the development of information science. It will serve as a useful asset in the collection of any information science scholar and student.This course material will also gives students and teachers an understanding of information science as a very real discipline, with its own academic and professional scope. But to find a further conceptual basis for the discipline, they are required to study journal articles, books and explore internet.

Objectives of the Course

After completion of this course the students will be able to:

1. Understand the history and basic concept of information science.
2. Discuss the information seeking behavior and evaluation in Information Retrieval.
3. Describe the sociological turn in information science.
4. Articulate the social informatics and sociotechnical research in UK.
5. Illustrate the information polices, electronic publishing and open access to information.
6. Explain social software, fun and games or business tools.
7. Explore the Journey of bibliometrics to webometrics.

Recommended Reading:

Gilchrist, A. (ed.). (2009). Information science in transition. London: Facet Publishing. Available at: https://books.google.com.pk/books?id=Jt4qDgAAQBAJ&printsec=frontcover&dq=Information+science+in+transition&hl=en&sa=X&ved=0ahUKEwiBr5_H4pbmAhWH2hQKHQeBAyAQ6AEIJjAA#v=onepage&q=Information%20science%20in%20transition&f=false

Suggested Readings:

1. Bolman, Lee. G, and Terrence E. Deal. (2003). *Reframing organizations: Artistry, choice, and leadership*. 3rd ed. San Francisco, CA: Jossey-Bass.

2. Cleveland, Harlan. (1985). *The knowledge executive; leadership in an information society*. New York: Truman Talley Books/E.P. Dutton.

3. Debons, Anthony, Esther Horne, and Scott Croneweth. (1985). *Information science: An integrated view*. Boston: G.H. Hall. Cited in Rubin, *Foundations of library and information science*, 479–480.

4. Dewey,Melvil. (1976). “The profession.” In *Landmarks of library literature 1876–1975*, ed. Dianne J. Ellsworth and Norman D. Stevens, 21–23. Metuchen, NJ: The Scarecrow Press.

5. Flexner, Abraham. (1915). Is social work a profession? Paper presented at the National Conference on Charities and Correction.

6. Glazier, Jack and Robert Grover. 2002. A multidisciplinary framework for theory building. *Library Trends* 50: 317–332.

7. Green, Samuel S. (1976). “Personal relations between librarians and readers.” In *Landmarks of library literature 1876–1976*, ed. Dianne J. Ellsworth and Norman D. Stevens, 319–330. Metuchen, NJ: The Scarecrow Press.

8. Greer, Roger C. (1987). “A model for the discipline of information science.” In *Intellectual foundations for information professionals*, ed. Herbert K. Achleitner, 3–25.

9. Boulder, CO: Social Science Monographs; New York: Distributed by Columbia University Press.

10. Greer, Roger C. and Martha L. Hale. (1982). “The community analysis process.” In *Public librarianship, a reader*, ed. Jane Robbins-Carter, 358–366. Littleton, CO: Libraries Unlimited.

11. Grover, Robert and Jack D. Glazier.(1986). A conceptual framework for theory building in library and information science. *Library and Information Science Research*8: 227–242.

12. Gulick, Luther. (1937). “Notes on the theory of organization.” In *Papers on the scienceof administration*, ed. Luther Gulick and Lyndall Urwick, 191–195. New York: Institute of Public Administration, Columbia University.

13. Kuhlthau, Carol Collier. (1993). *Seeking meaning: A process approach to library and information services*. Norwood, NJ: Ablex.

14. Levitan, Karen B.(1982). Information resource(s) management—IRM. *Annual Review of Information Science and Technology (ARIST)* 17 (1982):227–266.

15. Mason, Richard O., Florence M. Mason, and Mary J. Culnan. (1995). *Ethics of information management*. Thousand Oaks, CA: Sage Publications (Sage Series in Business Ethics).

UNIT NO.1
FIFTY YEARS OF UK RESEARCH IN INFORMATION SCIENCE; SMOOTHER PEBBLES AND THE SHOULDERS OF GIANTS: THE DEVELOPING FOUNDATIONS OF INFORMATION SCIENCE.

Introduction

Research that clearly falls under the 'information science' heading was already being carried out in the UK in the first half of the twentieth century, though the volume of such research was small. It was in the second half of the century that systematic research in this field and, indeed, the name itself became fully established, and that the amount of research began to grow rapidly. Today, information science has matured to the stage where even the study of its history has become a legitimate topic for research. A definition of information science acceptable to everyone has always proved difficult to find, from the early days right up to the present. There has, however, been greater agreement on what are the important topics that information scientists should study: most of the topics mentioned in the early days are still regarded as important today, though relative emphases have changed. The development of information science research as with most science and social science subjects is reflected reasonably well by the changing nature of the research papers published in its leading journals.

The UK is fortunate in possessing a number of internationally recognized journals that cover library and information science research. These, and especially the *Journal of Information Science* and the *Journal of Documentation*, have published a wide variety of research by British information scientists over the past 50 years. The contents of the *Journal of Information Science* cover all areas of the field and little that is not relevant, but it only started publication in 1979. The *Journal of Documentation* gives better time coverage, since it goes back beyond the beginning of the period.

Areas of information science research in UK

At the theoretical level, the input by UK researcher has been particularly significant. The idea of using Boolean operators for searching had already been mentioned by Bradford in his pioneering text on documentation. Another significant step forward in the early 1970s was the demonstration that automatic clustering of documents could be implemented as part of the searching process in order to improve the relevance of the items retrieved.

The definition of information retrieval used in includes cataloguing, classification, indexing and database creation along with the information retrieval activity itself. These different retrieval aids have varied in their relative importance over the past 50 years, but it has always been clear that they are linked together. The ever growing emphasis on all kinds of information retrieval means that the whole field has now become a mainline research topic. From being a characteristic component of information science, it has also become a widely investigated research topic in computer studies and related fields. As a consequence, it is becoming increasingly difficult to determine what particular input to information retrieval comes from researchers in information science.

The second major category of information research noted in UK was information seeking, including the whole field of user studies. Surveys of users had been carried out in library contexts before they became an important feature of information studies. In the latter area, the application of such surveys in the UK was stimulated by the work of Bernal and Urquhart on users of science information in the early post war years. Most user studies and there have been many of them over the past 50 years have been aimed at more specific groups or environments. Though science, technology and medicine have been a favored area for user studies, most other fields have been the subject of some investigation.

The rapidly expanding part played by computers in information handling has meant that information science research has come increasingly to overlap with work in computer science, particularly in the area of human computer interaction. At the same time as this rapprochement between computer scientists and information scientists has been occurring, the computerization of libraries has led to a new confluence of interest between library researchers and information scientists. This is reflected most obviously in the development of OPACs, where information science concerns with retrieval have equally become central to the activities of traditional libraries.

The growth in information science research over the past 50 years has been paralleled by the growth of research into communication studies. Communication research is more often concerned with the interactive exchange of information, and the information involved may well be transmitted informally for example, via conversations. A number of studies were carried out during the 1960s and 1970s some in the UK into the importance of informal communication as a method of acquiring additional information alongside that available from formal sources. Communication research has actually ranged widely in term of scope. An influential text on

the topic was published by a British author right at the beginning 50-year period, at it covered everything from philosophy to electrical engineering.

The growth of the digital world has made a significant contribution in information chain and communication. Over the last two decades, electronic journals have moved from the experimental stage to a major branch of publishing and this experiment was successfully carried out in the UK in the early 1980s. The concept of open access was introduced for the researchers' publication. The original simple idea was the researchers should put up the papers they had written on their website, as well as publish them in printed form; may be available to other researchers keeping in view the copyright/intellectual property law as a whole. Most of journals during this period were involved in general area of theoretical and quantitative studies. One of the terms that came to be used for such studies bibliometrics was actually coined in the UK. Within the UK, interest in bibliometic studies grew during the 1960s and 1970s, but then diminished, only to grow again in recent years. One area where the UK made a useful contribution in the earlier period was in the discussion of how usage of literature declined with its age, how the change might best be measured, and the implications for librarians and information scientists. More recently, the emphasis in the UK has been on how to measure the relative importance of different authors, papers or journals. A major driving force for this has been the wish to shift comparisons in the Research Assessment Exercise (RAE) towards a metrics-based approach. This has led to a number of innovative studies, with a particular interest in research which looks at ways of ensuring that different authors or subjects are compared equitably. Amongst all this activity, researchers have, of course, cast a beady eye on the RAE and the metrics of information science, itself.

Factors affecting information science research in the UK

The main influence on the development of information science research, in the UK has been the availability of funding. Senior scientists at the time were worried by the ever-expanding flood of scientific information, and saw the need for centrally funded support to study the problems that it caused. In mid of 1960s a new body Office for Scientific and Technical Information (OSTI) was formed and scientists soon obtained grants from the new body. This led them, on the one hand, to encourage new researchers and, on the other, to map out their own view of what topics were of prime importance.

Looking back over the past 50 years, one conclusion must be that past research in information science is now paying off. Activities that were

relatively marginal decades ago such as automated information retrieval are now at the heart of major growth industries. Although this has attracted greater funding support, projects nowadays are often more narrowly focused than in the past. The term ‘informatics’ formerly regarded with suspicion in the UK is now coming into favour as a description of this blending. The overall result is that the information science activities developed over the past 50 years have triumphed, but information science as a separate entity may be on the wane.

Smoother pebbles and the shoulders of giants: the developing foundation of information science.

Here our focus is on the *Journal of Information Science* (*JIS*) which was first published in 1979, replacing *The Information Scientist* (*TIS*) which – though described as the ‘journal of the Institute of Information Scientists’ – was not generally regarded as a true academic/professional journal. The intervening period of nearly 30 years, a time span commonly taken as equivalent to a ‘generation’, gives the opportunity to consider the issues covered in the early issues of *JIS*, to set them into the context of the development of the information science discipline over time, and to assess the significance of some of the main contributions and contributors.

This is done by focusing on some of the articles and editorials published in the first two volumes of *JIS*, covering the years 1979 and 1980, tracing some of the preceding treatment of the issues, and following later developments, particularly – though not exclusively – through the pages of *TIS* and *JIS*. The set of literature cited is selected to show the origins and development of the issues, and is in no way intended to be comprehensive. The discussion is focused around five main, albeit overlapping, themes. An initial consideration of the *information science discipline* itself leads fairly naturally to thoughts on the *foundations of the discipline*, and that in turn to the central question of the *nature of information*. There follows a consideration of the *relation between discipline and profession*, and in particular the role of research, and the closely associated question of the most appropriate form of *education for information science*. As we shall see, all of these themes are represented in the first issues of *JIS*, and all have remained ‘live’ topics to the present day.

In the conclusions it is all too easy in reflecting on the significance of past events or writings to make facile or false analogies: to say that things are the

same while the seeming similarity is actually superficial, or due to a change in the way that terms are used. This is not to suggest that no progress has been made, which would indeed be a dismal view. No is the story of the discipline and profession a negative one. Both have survived, despite the totally unanticipated changes in networked ICTs which have brought information and its communication to the forefront of professional, social, and economic life in a way which could not have been conceived 30 year ago. Perhaps most excitingly, we are now in a situation where the concept of information has entered the vocabulary of the physical and biological sciences, as a fundamental concept in an entirely novel way.

Self-assessment Questions

1. Define information science.
2. What are the major areas of discussion in first 30 years of UK research in the field of information science?
3. Enlist the major fudging agencies of UK in the field of information science.
4. Describe the factors who affected information science research in the UK.
5. Discuss major themes of research in UK in field of information science.

Activity

Write an essay with the help of tutor on the foundation of librarianship.

UNIT NO. 2
THE LAST 50 YEARS OF KNOWLEDGE ORGANIZATION: A JOURNEY THROUGH MY PERSONAL ARCHIVES; ON THE HISTORY OF EVALUATION IN IR

Introduction

The last 50 years is just a blip in the history of knowledge organization, if we take the story back to the Library of Alexandria in the third century BC, with its shelf arrangement designed by Callimachus and probably inspired by Aristotle. However, the period from 1958 onwards has seen a major shift in the focus of interest, and more than one transformation in the practicalities of how we apply the principles. A systematic review of developments would be too ambitious for this unit. Instead it juxtaposes an account of some milestone advances in the period, together with anecdotes illustrating how it felt to work in those times. ‘Principles and practice’, the byline of the *Journal of Information Science,* seems a fair summary of the approach.

The run-up to 1958, or, the rise and rise of Classification

At the time when the Institute of Information Scientists was launched, well established principles of classification, especially faceted classification, provided an excellent springboard for developments in knowledge organization thereafter. The principles of thesaurus construction and use were worked out during the first two decades of the Institute's existence. Up until the end of the 1980s, most practical systems to exploit any of these vocabularies were held on cards, some of them highly ingenious. The subsequent arrival of the desktop computer, soon followed by the growth of networks providing access to an almost unimaginable quantity and variety of resources, has stimulated evolution of the knowledge organization schemes to exploit the technology available. Anecdotes of events and practical applications of controlled vocabularies illustrate this account of developments over the period. By the time the Institute of Information Scientists was launched, the theory and pioneering development of classification schemes had seen their heyday. The problems of an enumerative scheme such as the Dewey Decimal Classification Scheme were well known. The curious fact remains that more and more libraries throughout the world continue to use it somehow it works. **Between 1959 and 1964:** the Aslib-Cranfield Research Project under the direction of Cyril Cleverdon and Jack Mills, ran a ground-breaking series of tests on ‘indexing languages’, including the UDC, a faceted classification, an alphabetical

subject catalogue and the uniterm system. This time the documents were indexed in three different ways:

- Key concepts, humanly selected and recorded as phrases occurring naturally in abstracts of the documents;
- Those same concept phrases, separated into single natural language words;
- Main ‘themes’, derived by combining the concepts in various ways.

The period 1990s: arrival of the personal computer, then the taxonomy was introduced. The step change came in the next decade, when personal computers began to appear on the desks of ordinary mortal. And it leapt even higher when the internet brought remote computer to our fingertips. The role of the information intermediary was threatened. The value of controlled vocabularies seemed more questionable than ever, given the improbability of persuading end-users to learn how to apply them. The software vendors were quick to spot the opportunity. They would provide a search/navigation facility, and what better name for it than ‘taxonomy’? Software products have proliferated, and so too have websites with all manner of ways of selecting for ma top list of subject area and ‘drilling down’ to progressive levels of specificity. As the taxonomy buzz-word spread around, many information professionals seized a different opportunity. For serious researchers in classification theory and practice, the opportunity was now to adapt the long-established principle of classification to the electronic medium. Not long after the widespread introduction of personal and desktop computers, the evolutionary path of knowledge organization schemes took another twist to adapt to networking opportunities.

The networks have opened up an array of different resources, systems and applications, and users want to search them all, at one pass. Indexing vocabularies can no longer be designed in isolation, if they are to serve in the interconnected world. Interoperability between systems is not just a buzz-word; there is a real demand. Important progress has been realized through the Dublin Core Metadata Initiative (DCMI), emerging from an OCLC workshop held in 1995 in Dublin Ohio. The metadata element has provided a framework within which other, more specialized metadata schemas and application profiles have been developed. Controlled vocabularies find their application here, especially for populating the subject element of metadata descriptions. In short if we traced back the history the greatest part of the

current credit goes to enhanced information technology rather than fundamental new thinking in knowledge organization.

On the history of evaluation in Information Retrieval (IR)

The foundation of the Institute of Information Scientists in the UK in 1958 coincides closely with the beginning of the notion of experimental evaluation of information retrieval systems. Although there had been some earlier attempts, we usually mark the start of the tradition as the Cranfield experiments, which ran from 1958 to 1966. Information retrieval is commonly regarded as a core component of information science, and systematic empirical evaluation of IR systems probably represents the strongest claim that information science can make to being a science in any traditional sense. There is a nice irony here: the founder of the empirical tradition in IR, the Cranfield librarian Cyril Cleverdon, was not at all a supporter of the Institute. But more of this anon.

As for the present, and despite the concerns of the founders of the Institute, academic information science is now quite closely associated with the former library schools, many of which have adopted titles which include the word 'information'. However, a lot of current work in IR, theoretical and experimental, takes place elsewhere, mainly in computer science departments, though several other academic domains are represented. It probably comes as a considerable surprise to a current PhD student, working on (say) a machine learning optimization technique applied to search engine ranking, that he or she is in thrall to an experimental tradition founded by a librarian, working with card indexes, a half-century ago.

Thus the history that is the subject of this unit is not too readily defined in terms of institutional or academic boundaries – or national ones. Despite this, it can be seen as a remarkably coherent development of a set of principles and methods. Like all academic subjects it generates argument and disagreement and heated disputation, but there remains a relatively stable common core, which has, despite its limitations, served us well over the last 50 years. Furthermore, while its present international status developed out of the US dominance for a large part of that period, the strength of the UK contribution has been remarkable.

In the quarter-century or so following Cranfield2 small experiments and works that took place are important some of these are as follows: SMART, Medlars, Karen Sparck Jones, Keen, Belkin and Oddy, Okapi, and Croft. In the system of Information Retrieval methodology is very important and there are many methodological issues here, but a major concerns the set of

documents to be judged for relevance. The ideal since Cranfield has been completeness discovering all of the documents in the collection that might be judged relevant. One method in this respect was used extensively TREC: is the pooling method-given the outputs of a range of different systems, judging a pool of the top 100 ranked items from each system is likely to give a reasonable variety of relevant documents. Moreover, at the heart of a search engine in the modern sense is a scoring-and-ranking algorithm. This may be used for various tasks, but most directly for ad-hoc retrieval, and therefore these algorithms became a major focus for the TREC ad-hoc task.

At the earlier stage in history of Information Retrieval experimentation, one might have been tempted to conclude that the basic methodological work was already done that we might settle down into a common, agreed way of doing experiments. This is far from the case. Although some of the ideas have remained remarkably stable, the field of IR experimentation is as exciting now, and is changing as fast, as it was the time of initial immersion, in the days of Cyril Cleverdon and Jason Ferradane.

Self-assessment Questions

1. Trace out the period when classification and thesaurus has come and rise.
2. Define the term controlled vocabularies. And explain different three ways of documents indexing.
3. How networking progressed and Dublin Core Metadata was introduced?
4. What do you mean by IR? Discuss its history.
5. Explain about some experiments which were took place in the quarter-century.

Activity

Visit HEC digital library on the internet and through search terms evaluate the information retrieval process of different queries and note down your experience.

UNIT NO.3
THE INFORMATION USER: PAST, PRESENT AND FUTURE; THE SOCIOLOGICAL TURN IN INFORMATION SCIENCE

Introduction

The ‘user’ has been of interest in librarianship and information science for much longer than either has existed as a focus for research. Virtually every development in the field has been concerned with making it easier for the user to access documents or information. Thus, the first ‘union catalogue’ in England was devised to make it easier for the scholar monks to locate wanted manuscripts in monastery libraries. Charles Ami Cutter's ‘shelf marks’ were designed to make easier the location of a specific book on the shelf, ‘open access’ was devised to make it easier for the library visitor to get the book he or she wanted without undue delay, Kaiser's ‘systematic indexing’ was devised to enable the rapid location of wanted pieces of information, and so on throughout the history of libraries and information centers.

It took some time, however, before the ‘user’ as a living, breathing person became the focus of attention in information research. Initially, the focus was on the system used, how it was used and by whom. Thus, the first library surveys were designed to discover what *categories* of persons used libraries, not what those persons did when they were in a library nor what life or work issues were behind their library use. When the Royal Society Scientific Information Conference was held in 1948, the information user was the focus of some attention, but, again the attention was directed towards the systems used; most of the reports and papers related to the documentation of science and to technical methods of handling the documents. The emergence of research on various aspects of ‘information behaviour’ is explored and its growth as a subject of academic research is documented. The growth of the field within information science is clearly discernible. When we compare the early work in this area with that of the period since 1980, three things are evident; first, in the early years the focus was on the information needs of scientists and, to a smaller degree, engineers; secondly, the methods employed were predominantly quantitative, mainly questionnaires with some records analysis and interviews; and, thirdly, there was little or no attempt to evoke or develop theoretical perspectives the intention of the research was entirely pragmatic. It is evident, then, that we have seen a move, over the past 60 years, from a concern by practitioners to discover guidelines for the

improvement of practice to research within an academic discipline. The origin of the field as a potential aid to the development of library and information services is noted, as is the transition from this status to that of a subject for research at PhD level and beyond. The development of the field has thus led to a division between the needs of academia for theoretically grounded work, and the needs of the field of practice for guidance for service development. The consequence of this for education for the information professions would be grave, and some may believe that the position has already been reached that professional education and research are irrelevant to practice. There is, today, a disconnection between research and practice, to a significant extent: early research was undertaken by practitioners but today academic research dominates the scene. Suggestions are made as to how this disconnection can be repaired.

Whatever the future holds for any of these issues, it seems likely that the need to understand how people search for and use information is likely to continue and, as technologies change and information services continue to develop, the understanding gained may become more and more important for the effective design of systems and services.

The sociological turn in information science

The history of the American Society for Information Science follows the move from documentation to information science, and era of profound changes in the world, the development of information becoming a new body of knowledge, emerging from several disciplines. If look back into the history and explores the history of ‘the social’ in information science. It traces the influence of social scientific thinking on the development of the field's intellectual base. The continuing appropriation of both theoretical and methodological insights from domains such as social studies of science, science and technology studies, and socio-technical systems is discussed. Information science, being as it is both relatively youthful and modest of size, routinely interacts with and draws liberally upon other subject fields for intellectual enrichment. The chunky concepts which make up our field’s intellectual core (e.g. knowledge, information, communication, representation) are neither owned by information science nor likely to be assembled into an entirely credible canon without the judicious addition of perspective and approaches taken form established discipline such as computer science, linguistics, philosophy, psychology and sociology, as well as from newer fields such as cognitive science and human computer.

Impressionistically, and speaking as someone who is reasonably familiar with the information science canon. We can say that our field has long been mindful of, and indeed receptive to, sociological thinking.

Self-assessment Questions

1. Why the focus of information science is on user? Discuss.
2. Describe the era when major studies of information use and user were conducted.
3. Discuss the sociology of information science.

Activity

What is the future of library profession in Pakistan in line with sociological changes in the society? Write an essay with the help of tutor.

UNIT NO.4
FROM CHEMICAL DOCUMENTATION TO CHEMOINFORMATICS: 50 YEARS OF CHEMICAL INFORMATION SCIENCE; HEALTH INFORMATICS: CURRENT ISSUES AND CHALLENGES

Introduction

Chemistry is, and has been for many years, one of the most information-rich academic disciplines. The very first journal devoted to chemistry was *Chemisches Journal*, which was published 1778–84 and then, under the name of *Chemische Annalen*, till 1803. The growth in the chemical literature during the nineteenth century led to a recognition of the need for comprehensive abstracting and indexing services for the chemical sciences. Chemoinformatics is a generic term that encompasses the design, creation, organization, storage, management, retrieval, analysis, dissemination, visualization and use of chemical information. Chemoinformatics is not really new: instead, it is the integration of two previously separate aspects of chemical structure-handling. The group of researcher considered thus far had developed techniques to store, search and process the molecules in databases of chemical structures, so as to identify useful sets of compounds; a second, almost totally distinct group of researcher had for many years developed techniques to model and to correlate the structures of those molecules with biological properties, so as to enable the prediction of bioactivity in previously untested molecules. At the risk of simplification, the former techniques were designed to handle the large numbers of molecules hundreds of thousands or even millions) that would exit in a database; the latter techniques were designed to handle the few tens (or the few hundred at most) of molecules for which the appropriate biological training data was available. Chemoinformatics is thus, at heart, a very specialized type of data mining, involving the analysis of chemical and biological information to support the discovery of new bioactive molecules. The recent emergence of chmoinformatics has been marked by the publication of several new books, and by a further change in the title of the core journal, which has been called the *Journal of Chemical Information and Modeling* since 2005. Chemoinformatics is, of course, continuing to develop, with three areas of particular importance for the next few years. The first, already mentioned, area is the use of machine learning methods for virtual screening. Machine learning and data mining are subjects of intense research in computer science,

with the resulting methodologies starting to be applies in very many application areas, including chemoinformatics. Thus techniques such as decision trees, kernel discrimination, and support vector machines have been rapidly adopted for chemoinformatics applications and this trend will undoubtedly continue as new techniques become available.

Most chemical publications will refer to one or more chemical substances. The structures of these substances form a vitally important part of the chemical literature, and one that distinguishes chemistry from many other disciplines. The Chemical Abstracts Service(CAS) Registry System was started in 1965 to provide access to substance information, initially registering just small organic and inorganic molecules but now also registering biological sequences. At the end of 1965 there were ca 222,000 substances in the System; by the end of 2006 this had grown to *ca* 89 million substances, of which *ca* one-third were small molecules and the remainder biological sequences, with *ca* 1.5 million being added each year. There are also many additional molecular structures in public databases such as the Beilstein Database, and corporate files, in particular those of the major pharmaceutical, agrochemical and biotechnology companies. The principal such service is Chemical Abstracts Service (CAS), which was actually established in 1907 and which acts as the central repository for the world's published chemical (and, increasingly, life-sciences) information. The size of this repository is impressive: at the end of its first year of operations, the CAS database contained *ca* 12,000 abstracts; by the end of 2006, this had grown to *ca* 25 million abstracts with *ca* 1 million being added each year.

Health informatics: current issues and challenges

Health care is a complex and information-intensive process in which data concerning the health and medical conditions of individual patients are stored and used for clinical care and management. Additionally, data are aggregated for secondary purposes, such as the management of local health services, the monitoring and surveillance of diseases, and for planning the delivery of health services at regional, national and international levels. Within health care organizations, services and systems, large volumes of data are collected, stored, analysed, transferred, and accessed on a daily basis. In addition to data on individual patients, up-to-date information on how to prevent, diagnose, treat and manage diseases from research is being published and is required by healthcare professionals to provide effective and safe care for patients and the public. Health informatics is a relatively new field that has

emerged in the last 20 years and has assumed a growing importance as a discipline. From a Donabedian perspective, health informatics can be regarded as being concerned with the structures and processes, as well as the outcomes involved in the use of information and information and communications technologies (ICTs) within health. The term ‘e-health’ has been coined to describe the application of these technologies in health and medicine.

Defining health informatics and related areas

Despite numerous attempts to define informatics, medical informatics, health informatics and health information management, no widely accepted definitions exist for these areas. Related to these three areas are other specific fields, such as nursing informatics, dental informatics and primary care informatics, which consider informatics applications, related to specific profession or health sectors. Research and developments in information and the use of ICTs in health and medicine may fall into one of the mentioned earlier areas or may overlap across two, or all three areas. The overall aim of health informatics is to develop and improve the organization and management of information and thereby improve the overall quality of care for patients, and to this group should be added their families and carers, and the general public.

Health informatics concerns the use of information and information and communication technologies within healthcare. Health informatics and information science need to take account of the unique aspects of health and medicine. The development of information systems and electronic records within health needs to consider the information needs and behaviour of all users. The sensitivity of personal health data raises ethical concerns for developing electronic records. E-health initiatives must actively involve users in the design, development, implementation and evaluation, and information science can contribute to understanding the needs and behaviour of user groups. Health informatics could make an important contribution to the ageing society and to reducing the digital divide and health divides within society. There is a need for an appropriate evidence base within health informatics to support future developments, and to ensure health informatics reaches its potential to improve the health and well-being of patients and the public.

A major focus of activity in health informatics (and medical informatics/health information management) has been the development of information systems for medical and health care. During the last 10-20 years

the focus has moved away from departmental or ward-based system to institutional/hospital-based systems and on, to operate at a regional, national or global level. The issues in developing electronic records for patient care help to illustrate the complexity of health information and issues faced within health informatics. The volume and range of information collected within a single episode of health care for an individual patient can be large. The required information can include textual, numeric, high resolution image and complex signal data collected by different health professional, including doctor, nurses, radiologist, pathologists and physiotherapists. These data record the personal details and medical history, symptoms and clinical measurements, diagnosis and prognosis, and treatment of the patient.

Challenges to health informatics

The collection, storage and retrieval of personal data on the health and medical conditions of individual patients is an important area of ethical concern within health informatics, and more widely in health and medicine. In addition to ethical issues surrounding the way these data are processed, the replacement of the traditional paper base medical records with electronic records, and the movement to computer based, and ultimately paperless system in health care organizations raises important ethical issues for those concerned in the care of patients and emphasizes the need for respecting human rights, security and privacy of data with health. The major challenge within health informatics is the financial investment required to develop, implement and maintain e-health initiatives, lack of financial support and high initial cost as barriers to adopting ICT in health care. Resistance to the development of ICT systems by health professionals and managers can create further problems once systems are implemented and he limited use of health informatics applications has meant that their potential has not always been realized. Quality within health informatics initiatives is a further issue that can affect successful development and implementation. The quality, both actual and perceived, of data entered into systems and then utilized for health care.

Opportunities for health informatics

Throughout the developing world the numbers and proportion of older people are increasing, and are likely to continue to rise until at least 2050. Within health informatics there is the opportunity to utilize ICTs and e-health initiatives to benefit older people and ageing populations, particularly in those countries in which the ratio of people of working age to those of

pensionable age is, or is becoming, low. The focus on developing telemedicine services, which provide remote consultations and diagnosis for patients with acute clinical conditions at a distance, such as for people living in rural areas far from specialist centers, has changed to developing tele-health service, in which chronic conditions can be managed at home through remote data collection and transfer of data through ICTs. This allows a more holistic approach, encompassing health promotion and disease prevention. In short health informatics is a specialized field and can benefit from multidisciplinary contributions from information science, health and medicine and the social sciences. Health informatics must address the specific issues that are unique to medicine and health. Understanding the needs of all users in the care process through research and evaluation of health informatics developments and e-health initiatives are important for the ultimate well-being and safety of patients.

Self-assessment Questions

1. Define chemoinforamatics.
2. Discuss the major contributions to historical development of chemoinformatics.
3. What is health informatics?
4. Discuss various challenges and opportunities to health informatics.

Activity

Visit any nearby medical center and check how they are keeping the record of their patients. Enlist the scheme of classification.

UNIT NO.5
SOCIAL INFORMATICS AND SOCIOTECHNICAL RESEARCH; THE EVOLUTION OF VISUAL INFORMATION RETRIEVAL

Introduction

Social Informatics is concerned with computerization, or the transformation in human activity that follows the implementation, use and adoption of computers in different types of organization. Historically, separate disciplines have explored this phenomenon from perspectives that focus on different stages of technological development: Human Computer Interaction has handled interface design and ergonomics; Information Systems has addressed analysis, design and implementation; LIS (Library and Information Science) has addressed information retrieval and use; Business and Management have addressed adoption and impact; Operations Research has modelled processes. Social Informatics (SI), in contrast, is transdisciplinary, tracing antecedents and consequences across these different phases of development, and treating technology as an evolving assemblage of interests, activities and artefacts that is shaped over time in local conditions.

The US tradition

In the United States, an explicit SI line of thinking was first articulated in the early 1970s by an eclectic group of analysts working at the University of California, Irvine, exploring information systems in local government across the US. Perplexed by the mismatch between accounts from engineering, managerial and operating staff of the impact of ICTs on organization, Kling and Scacchi produced an explanatory frame, the ‘web of computing’, in a seminal paper that was in effect a manifesto for a new line of inquiry.

The UK tradition

Though there are a number of centers in the UK where sociotechnical research is undertaken (for example at the Oxford Internet Institute, Brunel University, Lancaster University, the University of York, the Judge Institute at Cambridge and the Said Business School at Oxford), a comprehensive review is not possible here. It seems fitting in the JIS anniversary issue to focus on institutions where the span of activity is roughly commensurate with the 50-year period since the IIS was founded. Though the US and UK traditions share a common interest in the production of technology, and work

with complementary concepts and methods, formal links between the two have not been strong for much of the historical period under review. However, there are signs of fusion in the work of a current generation of researchers on both sides of the Atlantic. Sociotechnical research is sometimes presented as an overly localized, non-analytic line of work. Many UK sociotechnical researchers undertake a larger task, that of tracing links between local observations and a wider set of social phenomena, addressing micro-, meso- and macro-level developments. The SI researchers in the United States a fundamental interest in the production of technology, and the complex processes that are involved. These researcher works with an eclectic repertoire of concepts and methods that draws on both traditions.

The evolution of visual information retrieval

The retrieval of images or image sequences that are relevant to a query is a long-established activity which has evolved quite remarkably during the last 50 years, from the special preserve of a relatively few professional practitioners to the forefront of research in computer vision and a leading edge domestic application of information technology. This extension of traditional information retrieval activity includes both still and moving images, the former usually characterized in the literature as ‘image retrieval’, the latter as ‘video retrieval’, and the two in combination, sometimes, as ‘visual information retrieval’. The literature of visual information retrieval has grown at a stupendous rate. To quote Jörgensen (1999), in her landmark text within the field: Adjectives such as ‘vast’ are often applied to the various literatures … related to image processing, but even this designation is an understatement. More remarkable still is the fact that almost all of that growth has taken place since the early 1990s, and reflects those technological advances which brought the digital image to the attention of the computer scientist. Greatly increased availability of images via the internet, then via mobile platforms, and most recently as an aspect of the social networking phenomenon, has been said to place us on the hinge of an important historical swing back towards to what may be called the primacy of the image.

Visual images exist in a wide variety of forms, but it is those whose features can be captured and/or viewed by unenhanced human vision, encountered typically as photographs or art work, which have predominated in the literature of image retrieval. The curatiorial or commercial imperative to collect other type of still image, including those the features of which must be captured and/or viewed by means of equipment which expands the range of human vision, such as microscopes, telescopes and electronic imaging

devices, has been less pronounced. The technology to support the display of sequences of images in rapid succession in order to create the illusion of moving imagery has only given rise to collections of film and video material in more recent times. Because of their scale and growth rate, however, such collections have also figured significantly in the literature of visual information retrieval, and the locating of that activity within the wider context of multimedia retrieval.

Film and video libraries presented a different appearance, their shelves laden with tins containing reels of film, the chemical properties of which called for special knowledge and a controlled environment. Prior to viewing, determination of the potential relevance of complete films was assisted by the short synopses which sometimes augmented their catalogue records. The retrieval of image sequences, as opposed to whole films, was more challenging. Protracted viewing of material in order to make selections might be assisted by time-coded listings of each shot within a film, but the compilation of such tools was itself a highly labour-intensive operation, the undertaking of which reflected a clear commercial imperative. Content-based image retrieval*, also known as query by image content* ('QBIC) and content-based visual information retrieval (CBVIR) is the application of computer vision techniques to the image retrieval problem, that is, the problem of searching for digital images in large databases for a recent scientific overview of the CBIR field. Content-based image retrieval is opposed to traditional concept-based approaches. “Content-based" means that the search analyzes the contents of the image rather than the metadata such as keywords, tags, or descriptions associated with the image. The term "content" in this context might refer to colors, shapes, textures, or any other information that can be derived from the image itself. CBIR is desirable because searches that rely purely on metadata are dependent on annotation quality and completeness.

Having humans manually annotate images by entering keywords or metadata in a large database can be time consuming and may not capture the keywords desired to describe the image. The evaluation of the effectiveness of keyword image search is subjective and has not been well-defined. In the same regard, CBIR systems have similar challenges in defining success. “Keywords also limit the scope of queries to the set of predetermined criteria." and, "having been set up" are less reliable than using the content itself.

The first milestones along the development path which led to content-based image retrieval (CBIR) were encountered in the late 1970s in the form of databases constructed specifically for picture storage and retrieval. The

earliest attempts at image database construction were characterized by the difficulties encountered in attempting integration of image data and relational database structures. The 1990s saw the launch of a number of experimental CBIR (Query By Image content). Other systems, including Blobworld, Excalibur, MARS, Photobook and VisualSeek followed; comprehensively surveyed in, a comparative evaluation was also undertaken. For more traditional image retrieval applications, however, ‘semantic image retrieval’ and the ‘semantic gap’ began to penetrate the literature from the mid 1990s onwards, with Gudivada and Raghavan, in a special issue of IEE computer devoted to CBIR systems. The semantic gap is that rift in the image retrieval landscape between the information that can be extracted automatically form a digitized image and the interpretation that humans might place upon the image.

In short, if we draw of picture of history we find an attempt has been made to draw, necessarily in a highly selective fashion, on the literature of image and video retrieval in order to outline the development of theory and practice in this absorbing variant of information retrieval. Drawing on a voluminous literature, the context in which visual information retrieval takes place is followed by a consideration of the conceptual and practical challenges posed by the representation and recovery of visual material on the basis of its semantic content. An historical account of research endeavours in content-based retrieval, directed towards the automation of these operations in digital image scenarios, provides the main thrust of this unit. Finally, a look forwards locates visual information retrieval research within the wider context of content-based multimedia retrieval.

Self-assessment Questions

1. What is difference between UK and US tradition of social informatics?
2. What is CBIR?
3. How important is visual information retrieval system?

Activity

Google is an important search engine and its image search is good. Visit the google and through its image search module try various images searching and note down your experience.

UNIT NO.6
INFORMATION POLICIES: YESTERDAY, TODAY, TOMORROW; THE DISPARITY IN PROFESSIONAL QUALIFICATIONS AND PROGRESS IN INFORMATION HANDLING: A EUROPEAN PERSPECTIVE

Governments first began to be concerned with the idea of ‘information policy,’ and the modern sense of the term, some time around the late 1970s and the early 1980s. The earliest use of the term ‘information policy’ in relation to governments, however, goes back to activities that began under the name of propaganda in the First World War. The UK Government set up a Ministry of Information in 1917; it was dissolved in 1918, but re-established the day after the Second World War broke out in 1939. Its role in that war covered news and press censorship and home and overseas ‘publicity’. Wound up in 1946, it was replaced by the Central Office of Information which today defines itself as ‘the Government’s centre of excellence in marketing and communications’. In the USA, a parallel body – the Office of War Information – was set up in 1942 (US National Archives and Records Administration). It established a Joint Committee on War Information Policy with the UK, which was dissolved at the end of the war.

Information is power, but both information and power are morally neutral each has the ability to enslave and to release, and the important thing is what standards serve as our guide as we attempt to strike the balances and re-strike them every year. The end of the 1960s marks the transition to the characteristic modern concerns of national information policies. By 1970 most of the elements that make up the contemporary idea of national information policy had emerged: what governments tell their own population and those of other countries for their own policy purposes; protection of personal data and freedom of information; collection of statistical date for policy-making; and the use of ICT to manage and analyse information. In 1976 a first formal statement of National Information Policy appeared in the USA, in response to a Presidential Directive (from Richard Nixon, though by the time it appeared he had been replaced by Jimmy Carter). Published by the National Commission on Libraries and Information Science, which had been closely involved in its preparation, it recommended that the USA should develop a coordinated National Information Policy, managed centrally and supported by an advisory committee representing the private sector, local government, and the academic and professional disciplines concerned with

the issues discussed in it. The report gave a clear and comprehensive statement of those issues, from the impact of ICT and its potential for shaping the quality of decision, to post-industrial society and its influence on the economy and employment, and existing legislation on freedom of information and privacy.

It has been observed the main goals of information policy are similar in many countries, while the mechanisms chosen to achieve the, vary widely. In East Asia governments as relying on partnership between the state and the private sector, and the ‘evidence seems to suggest’ that this model is more likely to be successful, especially for small countries, whose ICT infrastructure can be viable only if it occupies a monopoly position. For this reason, in East Asia, the state retains ownership of infrastructure but encourages competition in construction and operation. But the national approached across the East/West division are different: policy development by the executive branch of government (Scandinavia, Japan, Singapore); delegation to an advisory body of experts from the sectors that will be most affected by changes (Sweden Canada, Australia); and a combination of these two, leaving the executive responsible for developing policy (European Union, USA). On this analysis, the UK differs from all these, by relying on informal and piece rneal ’muddling through’, which makes it impossible to point to a single document that describes what British national information policy encompasses. Governments of all kinds encounter inherent problems in the field of national information policy. Those problems interact with political, economic, social and cultural factors, which influence how governments respond to them, and the response changes over time. The main issues relate to: the nature of information itself, power relations, and the economic issue of market orientation vs public good. The issues and tensions that have characterized attempts to develop and implement policies on the national and organizational scale are discussed here in this unit, with particular reference to: the power relations between the parties to them; the relative significance accorded to information technology and information content; the transition from formulating policy to acting on it; and the threats to the survival of those policies that get as far as implementation. In conclusion, the contribution to date of information science to the theory and practice of information policies is assessed, and suggestions are offered on directions for future efforts, in the light of the past of this interesting field.

The disparity in professional qualifications and progress in information handling: a European perspective

The technological base of the major industrial powers in Europe was chemistry, engineering, pharmaceuticals, etc., all of which were major generators and consumers of information. In 1957 a new political structure for Europe was created, reflected by the Treaty of Rome. Essentially, it created three bodies, one political and two industrial, to develop the future of Europe or, at that time, a part of geographical Europe. In terms of the information sector, the information raw materials of industrial Europe were primarily the results of scientific endeavour, as published in scientific journals. The development of the role(s) of information professionals in the 50 years since Institute of Information Scientists (IIS) was founded. What the founder of Institute of Information Scientists (IIS) foresaw was that there was a need to recognize that material of this nature needed a different treatment, which was not recognized by the majority of information-related professional bodies extant at that time. For example, one of the founders of IIS was a specialist in patent information, an area where ‘normal’ publication *per se* was not an option, but where information was a critical component. Patent information was and is an international activity, which has been recognized since the inception of the patent system. Apart from being recognized as a specialized niche, in information terms, patents and their associated legal partners, trademarks, were not part of mainstream information, as recognized by professional bodies. The creation of a European industrial/political entity predicated the need to create a wider information environment.

The history of international nature of information mainly concentrated on the implementation of new technologies to provide solutions to information issues, but it is recognized that information systems and services, especially those in science and technology, have a long history of being international. German and French being primary examples, but Russian, Japanese and Chinese have also made significant contributions. Various political developments in the first half of the twentieth century have ensured that English became the de facto language of science and technology, although other languages were active. Much of the development of technologies applied to information originated in the USA and later moved to Europe, but knowledge of English was a requirement in order to keep up to date with developments. Therefore, many of the applications which have given rise to the widespread use of computing in dealing with the management of information have their origins in the USA and the UK, where the common

language facilitated the transfer of know-how. A remarkable piece of work by Noyer and Serres at the University of Rennes (France) provides us with a time line of the history of the handling of information, as the working title says, *From Paul Otlet to the Internet by way of Hypertext*. The text is in French but the names are immediately recognizable by those with even a passing interest in the developments.

Europe was already a highly developed information environment before 1957, but it might be argued that in the post-1945 period the country that had earlier been at the forefront of technological development, Germany, had other priorities and in very general terms Europe had slipped behind the US and Japan in its economic progress. After the formation of the EU in 1957 one of the priorities for the new grouping was technical development, in particular through the Euratom vehicle. Research centers were set up in a number of locations and ancillary services to serve them, including information services, were started. As the time line has shown, the majority of the developments in information management using new technologies had taken place in the USA in the period 1950-70, but European institutions had been partners in certain areas. The unit has selected certain actions which have had the effect of extending the international nature of information, looked at the work undertaken to coordinate the training of information professionals examined, by examples of the work being undertaken by information professionals, whether these have had any effect on their activities. This unit also reviews briefly the situation when IIS was formed, from the viewpoint of professional requirements and the developments since. The conclusion is drawn that today's information world, very different from that of 50 years ago, faces similar problems of a lack of suitable qualifications and a confusion in the roles of different actors in the field.

Self-assessment Questions

1. What is information policy? Discuss its historical background.
2. Which language is the de facto language of science and technology?
3. Describe the nature of information.
4. Discuss the professional qualification of information professionals.

Activity

Prepare a draft of information policy for Pakistan with the help o f tutor.

UNIT NO. 7
ELECTRONIC SCHOLARLY PUBLISHING AND OPEN ACCESS

Introduction

The scholarly publishing industry has been greatly affected by the digital era, because 'the very content of the publishing business is, at the end of the day, a digitizable asset. Scholarly publishers realized soon after the development of electronic databases in the early 1970s that 'the content they acquire is an asset that can be manipulated and stored in digital form' and, led by various experimental projects such as Quartet, a study of electronic journals funded by the British Library in the 1980s, they gradually over the next 30 years made the move from printed format to digital format, seeing it as a cheaper, faster and more effective method of getting their titles to their readers The electronic journal, with one of the earliest launched in September 1990 (*Electronic Journal of Communication*). It was an early, free, online, peer-reviewed journal. During the second half of the twentieth century, there was an 'explosion of Scientific, Technical and Medical (STM) publishing with a consequent impact on libraries and the research process.

Academics supported this expansion because of its capacity to report rapidly the latest scholarship and research. From the 1970s, there was an interest in the use of electronic publishing not only because the traditional role of the scholarly publication-both to report results quickly so that an author could stake a claim to that research output before his or her rivals, and as a forma record of peer-reviewed scholarly achievement-was under stress in the print world, but also because the two functions could be achieved better in the electronic environment. Scholars also realize din the 1990s that the use of the world wide web would 'accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge. Moreover, the authors would submit their papers electronically to a computer which could be accessed by their editor. The: the editor read the paper in this for, and perhaps sent it to a referee's computer; the referee's comments were returned electronically to the editor, who transmitted them to the authors. In other words, the traditional process was simply replicate din electronic form.

At present, the electronic scholarly communication market is dominated by the USA. A few years ago, it was estimated that the USA accounts 58% of

STM literature, Europe 26% and the rest of the world a mere 16%. Scholarly journal production growth has been variable since the beginning of the twentieth century. Scholarly journal prices are rising much faster that libraries' budgets, and this is a major concern for many authors, librarians and institutions. In the UK, it has been estimated that between 1998 and 2003 the average price of an academic journal rose by 58%, while the UK retail price index rose by 11% in the same period. It is this concern that has caused many academics and librarians to consider other means of providing research output at lower cost, or even for free. This is one (but by no means the only) reason why there is so much interest in a new publishing model - Open Access (OA)- that offers a vision of research output freely and widely available throughout the world. The term OA covers two different approached – that of institutional repositories and open access journals. Though still a relatively small area of scholarly journal publishing, OA in principle offers free of charge access worldwide to primary scholarly research outputs. In fact, this claim is somewhat simplistic, as access to OA requires reliable networked computer and reliable telecoms and power supplies to be in place-not something that is universally available.

Several developments have created pressure for change in the formal system of scholarly communication. The most important of these are developments in technology. The emergence of the internet and networked technology has given the scholarly community the tools to bring to reality large-scale, barrier-free access to research and scholarly writings, without the necessity of utilizing commercial publishers. The internet has enabled scholars with access to a computer and the internet to communicate worldwide the fruits of their intellectual work. In particular, the new technologies offer publishers (and that means anyone who publishers, not just the organizations traditionally thought of as publishers) the opportunity to overcome key limitations of traditional print media, such as: size limitations in content storage and delivery, the cost of printing and the time-consuming and expensive delivery of product. It is important to distinguish the two forms of OA that have gained the widest support the so called green and gold routes. Green IA refers to so called self-archiving, whereby an author places a copy of the scholarly output in one or more OA repositories (these may be an institutional repository (IR), a subject-based repository, or a combination of them). The same item may well also appear in a traditional journal (which may be print, parallel published or electronic only). The business models for such gold OA journals are the only possible business model, and indeed, the majority of gold OA journals receive modes or no income from any source. It

is also a misnomer to call the business model 'author pays' because in practice, it is the author's employer or funder who pays, not the author him or herself. One of the more depressing things about current debates on OA is that it is so focused on a minority of OA outputs (gold, author pays) and even for these, a misleading name is given. Researchers have little interest in making money from their research outputs, and regard toll-based access-barriers as restricting their potential impact to only those who can and do pay the access-tolls.

Quality is a big issue in electronic publishing. There is a widely held suspicion (certainly amongst commercial publishers and to lesser extent amongst authors) that article in gold OA journals are less well peer-reviewed than their counterparts in toll-access journals. Whilst there is no evidence that weaker papers appear more often in Gold OA journals than in toll-access journals. A related concern is whether OA really does, as it has been claimed, increase citation counts (and, by implication, impact) of an article. The matter has been reviewed in various studies, there does seem to be clear evidence of increased citation counts for OA materials, which refutes the second charge, noted earlier, that OA journal editors are under pressure to accept lower-quality articles. The well-known 'Faustian bargain' occurs when authors assign copyright in their scholarly output to a publisher in return for the publisher improving, delivering and marketing the output. For many years, this bargain was accepted as equitable by authors, but this is no longer the case because of the advent of OA. Ownership of copyright give the owner the right to authorize, or prevent, a number of so-called 'restricted acts', including to reproduce the work, to modify the work, to distribute the work, e.g. through the internet, to perform the work in public or to broadcast the work. In short, in this unit rather than looking back at the last 50 years of the scholarly publishing industry, some recent developments in the electronic scholarly publishing arena are considered. The focus is on the publication of primary scholarly information, i.e. publications that report original research findings (typically peer-reviewed), rather than on electronic abstracting and indexing databases (whose history has been well reviewed in and whose current situation can be gleaned from news items and comments in journals such as *Online*). There is also an emphasis in this article on electronic journals rather than e-books, as the e-book scholarly monograph market is very small at the moment. Moreover, the recent developments in electronic publishing, with a focus on Open Access (OA) have been provided. It describes the two main types of OA, i.e. the 'gold' OA journal route and the 'green' repository route, highlighting the advantages and disadvantages of the

two, and the reactions of the publishing industry to these developments. Quality, cost and copyright issues are explored, as well as some of the business models of OA. It is noted that whilst so far there is no evidence that a shift to OA will lead to libraries cancelling subscriptions to toll-access journals, this may happen in the future, and that despite the apparently compelling reasons for authors to move to OA, so far few have shown themselves willing to do so. Conclusions about the future of scholarly publications are drawn.

Self-assessment Questions

1. Why authors prefer to use electronic publications/journals?
2. Discuss the various approached of open access journals.
3. Is internet driver of change in electronic publishing? Explain.
4. What is open access. Discuss in detail?
5. Discuss quality and copyright issues in electronic publications (OA).

Activity

Write a comprehensive note on the electronic journals database provided by HEC and Open access sources.

UNIT NO. 8
SOCIAL SOFTWARE: FUN AND GAMES, OR BUSINESS TOOLS?

Introduction

Fifty years ago information was stored on punch cards. SDI services appeared about 10 years later and databases were available online from about 1978. In 1988 PCs were in common use and by 1998 the web was being used as a business tool. The web of the 1990s might be thought of as ‘Web 1.0’, for now in 2008 there is much hype about Web 2.0, but what does that mean? Web 2.0 is an umbrella term for a number of new internet services that are not necessarily closely related. Indeed, some people feel that Web 2.0 is not a valid overall title for these technologies. A reductionist view is that of a read–write web and lots of people using it. Tim O'Reilly and colleagues introduced the term in 2004 and later produced a report refining the concept.

O'Reilly defines eight core patterns of Web 2.0:

1. Harnessing collective intelligence
2. Data as the next ‘Intel Inside’
3. Innovation in assembly
4. Rich user experiences
5. Software above the level of a single device
6. Perpetual beta
7. Leveraging [sic] the long tail
8. Lightweight software and business models and cost effective scalability.

He expands on these patterns as follows. Harnessing collective intelligence is sometimes described as *the* core pattern of Web 2.0; it describes *architectures of participation* that embrace the effective use of network effects and feedback loops to create systems that get better the more that people use them. The second core pattern above is jargon for the fact that information has become as important as, or more important than software, since software itself has become a commodity. Social software includes a large number of tools for online communication, e.g. instant messaging, text chat, internet for a, weblogs (or blogs for short), wikis, social network services, social guides, social bookmarking, social citations, social libraries and virtual worlds. Most of us are familiar with applications such as instant messaging (e.g. Internet Relay Chat, IRC), Internet fora, blogs and wikis.

Skype is a well-known example of the use of Voice-over Internet protocol (VoIP).

Social networking is the use of internet-based social media sites to stay connected with friends, family, colleagues, customers, or clients. Social networking can have a social purpose, a business purpose, or both, through sites such as Facebook, Twitter, LinkedIn, and Instagram, among others. Social networking has become a significant base for marketers seeking to engage customers. Despite some stiff competition, Facebook remains the most popular social network, with a reach 90 percent of U.S. mobile users, as of October 2018, the most recent data available, as of early 2019. It was followed, in order of popularity, by Instagram, Facebook Messenger, Twitter, and Pinterest. Marketers use social networking for increasing brand recognition and encouraging brand loyalty. Since it makes a company more accessible to new customers and more recognizable for existing customers, social networking helps promote a brand’s voice and content. For example, a frequent Twitter user may hear of a company for the first time through a news feed and decide to buy a product or service. The more exposed people are to a company’s brand, the greater the company's chances of finding and retaining new customers. Marketers use social networking for improving conversion rates. Building a following provides access to and interaction with new, recent and old customers. Sharing blog posts, images, videos or comments on social media allows followers to react, visit the company’s website and become customers.\

Wikis, Blogs and feeds

One of the best known wikis is Wikipedia. As of September 2007 it boasted 8.2 million articles in 253 languages. It is one of the 10 most visited sites on the web. Blogs are now in such common use that engines (e.g. Google blog search and Technorati have been developed specifically to search them. Most of us are also familiar with web feds such as RSS and Atom. RSS (Really Simple Syndication or Rich Site Summary) is a family of web feed formats used to publish frequently updated content such as blog entries, new headlines or podcasts. The podcast is a digital media file, or a series of such files, that is distribute over the internet using syndication feeds for playback on portable media players and personal computers.

Social networks and guides

User-generated content and virtual communities are not new phenomena. Virtual communities have been use since the 1980s. The ChemWeb.com community in the 1990s had virtual lectures and discussion groups but the technology of the time was not capable of supporting the visionary features it wanted to offer. A number of cultural factors were also involved in its decline. YouTube is just one of very many social network services. Another well-known example is Flicker (for sharing photographs). Social guides such as WikiTravel and TripAdvisor cater for specific interests, in this case travel. TripAdvisor carries over 10 million reviews and opinions of hotels, vacations etc. supplied by travelers. The various Web 2.0 applications do not operate in isolation. They can be joined together in ‘mash-ups’, web applications that combine data and/or functionality form more than one source. A mash-up example is TripAdvisor, Google maps which combines the hotel popularity index. Facebook and MySpace are hugely popular consumer networking sties. Facebook claims that it has 77 million active users with about 250,000 new registrations every day.

MySpace figure are more elusive: the press office supplies them by telephone to accredited representative of the media. Even though such social networking sites are ostensibly for consumers, they have been used by universities and commercial employers to check up on the activities of students or the validity of curricula vitae. Social networks such as LinkedIn and XING for business and professional use are also growing in popularity. One of the problems with social networks is that it might be necessary to belong to more than one in order to communicate with all one’s friends. A social networking service (also social networking site, or SNS or social media) is an online platform which people use to build social networks or social relations with other people who share similar personal or career interests, activities, backgrounds or real-life connections.

The social network is distributed across various computer networks. The social networks are inherently computer networks, linking people, organization, and knowledge. Social networking services vary in format and the number of features. They can incorporate a range of new information and communication tools, operating on desktops and on laptops, on mobile devices such as tablet computers and smartphones. They may feature digital photo/video/sharing and "web logging" diary entries online (blogging).Online community services are sometimes considered social-network services by programmers and users, though in a broader sense, a social-network service usually provides an individual-centered service whereas online community

services are group-centered. Defined as "websites that facilitate the building of a network of contacts in order to exchange various types of content online," social networking sites provide a space for interaction to continue beyond in person interactions. These computers mediated interactions link members of various networks and may help to both maintain and develop new social ties.

Social networking sites allow users to share ideas, digital photos and videos, posts, and to inform others about online or real-world activities and events with people in their network. While in-person social networking – such as gathering in a village market to talk about events – has existed since the earliest development of towns, the Web enables people to connect with others who live in different locations, ranging from across a city to across the world. Depending on the social media platform, members may be able to contact any other member. In other cases, members can contact anyone they have a connection to, and subsequently anyone that contact has a connection to, and so on. The success of social networking services can be seen in their dominance in society today, with Facebook having a massive 2.13 billion active monthly users and an average of 1.4 billion daily active users in 2017.LinkedIn, a career-oriented social-networking service, generally requires that a member personally know another member in real life before they contact them online. Some services require members to have a preexisting connection to contact other members.

The main types of social networking services contain category places (such as age or occupation or religion), means to connect with friends (usually with self-description pages), and a recommendation system linked to trust. One can categorize social-network services into four types:

- Socializing social network services used primarily for socializing with existing friends (e.g., Facebook)
- Online social networks are decentralized and distributed computer networks where users communicate with each other through internet services.
- Networking social network services used primarily for non-social interpersonal communication (e.g., LinkedIn, a career- and employment-oriented site)
- Social navigation social network services used primarily for helping users to find specific information or resources (e.g., Goodreads for books)

Information professionals were early adopters of Web 2.0 technologies. In June 2007 LexisNexis announced the results of a nationwide survey showing

that 39% of information professionals' access blogs at least weekly and 34% access wikis. Video or audio podcast were used less: 16% access video podcasts and 15% audio podcasts. In the last we conclude our discussion in this unit in following words: This is the era of social networking, collective intelligence, participation, collaborative creation, and borderless distribution. Every day we are bombarded with more publicity about collaborative environments, news feeds, blogs, wikis, podcasting, webcasting, folksonomies, social bookmarking, social citations, collaborative filtering, recommender systems, media sharing, massive multiplayer online games, virtual worlds, and mash-ups. This sort of anarchic environment appeals to the digital natives, but which of these so-called 'Web 2.0' technologies are going to have a real business impact? This unit addresses the impact that issues such as quality control, security, privacy and bandwidth may have on the implementation of social networking in hide-bound, large organizations. Some people are already using the term Web 3.0, Web 4.0 and so on, usually without any clear definition or strategy. No doubt, in about five years' time something new on the web will be making an impact, whether it be Web 3.0, Web 4.0, Web 5.0 and beyond, the semantic web, or something completely different.

Self-assessment Questions

1. Briefly explain the role of social networking in education.
2. Discuss the role of YouTube, Mash-up, Facebook in Social network and guides.
3. Enlist the most popular websites of social networking.
4. Describe the Web 2.0 technologies, some issues and importance.
5. Discuss the main types of social networking services.

Activity

How teachers can get help from YouTube to teach their students? Initiate and debate in the class and note down the important points.

1.

UNIT NO. 9
BIBLIOMETRICS TO WEBOMETRICS

The last 50 years have seen two major technological changes in scholarly publishing and two major changes in the way research can be quantitatively analysed, alongside numerous less significant developments. The two publishing changes are the computerization of the printing process, reducing costs significantly and allowing more journals and books to appear in print; and the conversion of the entire publishing cycle (submission of articles, refereeing and publication) to the internet, allowing faster and possibly cheaper communication throughout. Historically, the first major change for the development of quantitative analysis of academic publishing (bibliometrics) was the creation of the Institute for Scientific Information (ISI, now Thomson Scientific) citation database, which began functioning in 1962, together with associated post-war sociological theory allowing it to be used to assess the impact of scientific work. Since then there has been a continuous increase in the computing power available in universities, which has helped to make increasing numbers of bibliometric analyses possible. The second major development for bibliometrics was the web publishing of an increasingly broad range of research-related documents, from articles to email discussion lists, allowing the creation of a range of new metrics relating to their access and use.

Bibliometrics is the statistical analysis of books, articles, or other publications. The analyses are used to track author or researcher output and impact. This can help in promotion and tenure, as well as aiding in funding and grants. Bibliometrics are also used to calculate journal impact factors, which can help you decide into which journal to publish. The individual measures used are also commonly referred to as bibliometrics, or citation metrics. They can be used to evaluate the influence of an individual research output, such as a journal article, or a collection of research outputs, such as all works by a particular author, research group or institution.

Importance of Bibliometrics

- Bibliometrics can be used as an indication of the importance and impact of our work or that of a research group, department or university, and therefore of its value to the wider research community.
- Applications for funding, research positions or promotion may require bibliometric data and we may choose to include it in our CV.

- Bibliometrics are increasingly being used to measure and rank research output both within institutions and on a national or international level. University rankings may take bibliometrics into account and they are utilized in the Research Excellence Framework (REF).
- Bibliometrics can be used as a tool to identify research strengths and inform decisions about future research interests.

Disciplines of Bibliometrics

- Differences in publishing practices between disciplines means that bibliometrics cannot be compared across disciplines.
- Bibliometrics are generally focused on citation data from journal articles. They may therefore be less relevant in disciplines that are less reliant on journal publishing, such as the arts, humanities, social sciences, computing science and engineering.
- Resources available are Web of Science and Scopus. Web of Science includes the InCitestool for detailed analysis, which is available to all UCL users but requires initial registration.
- Google Scholar also contains citation data, as does Dimensions. Both of these are free but have limitations on what data is available.
- When reporting bibliometrics it is important to state the source of the data.

Limitations in using Bibliometrics

Bibliometric data offers a quantitative method of analyzing authors' or journals' output, but there are limitations with using bibliometrics:

- Comparisons between **subject areas** must be avoided. Some subject areas have a higher rate of publication and citation. For example, molecular biology articles are produced rapidly and cited frequently compared to computer science or mathematics articles. This means that an average molecular biologist would probably have a larger h-index than a leading computer scientist.
- It is important not to make comparisons between **authors of different ages** or length of professional activity. Authors who have published for many years have had more time to accumulate citations and reputation. You can to some extent limit bibliometric results to a specific date range, for a fairer comparison.
- Papers often have **multiple authors** - but what proportion of the work can be attributed to each author? Citation metrics assume that each named author is equally accountable, when this might not always be the case.

- Citation counts could be misleading, for example if an author includes a large number of **self-citations**, or if a peer group agree to cite each other to boost their citation rates. The peer review process for journals should spot and prevent this.
- **Negative citations** are counted as valid.
- Papers may be submitted under **various forms of name** although it is in fact the same author. There is also a lack of standard **affiliation details**. Databases have ways round this including grouping name variants and assigning each researcher an individual numerical ID.
- Some **publication types** tend to receive more citations than others. Review articles and methods papers, for example, are likely to be more highly cited than a paper based on a laboratory study.
- Citation metrics will differ depending on the **data source**, as different databases include different journals and years of coverage.

In addition, bibliometrics are a measure of the impact of research on further research, not necessarily of the quality of that research. Bibliometrics should therefore always be used with caution and not be considered a replacement for peer review, but best used to complement or verify qualitative evaluation. The field of bibliometrics studies publication patterns by using quantitative analysis and statistics. Bibliometrics can be either descriptive, such as looking at how many articles your organization has published, or evaluative, such as using citation analysis to look at how those articles influenced subsequent research by others. Counting publications can be useful for doing some comparisons, but citation analysis allows you to look at the impact those articles have had on others by determining how often they are cited. Citation analysis can also show what journals, organizations, and even countries have high impact in different fields of research. The Institute for Scientific Information (ISI) has been a leader in the citation analysis field since 1961, when ISI published the first Science Citation Index. Pacific Northwest National Laboratory (PNNL) has been using data from ISI for both descriptive and evaluative purposes. This data is used to track what the researchers at the Laboratory are writing and then comparing research groups within the organization over a period of years to identify trends and opportunities. PNNL has also used citation analysis to explore what organizations and academic institutions are doing research in certain fields for partnering opportunities.
Bibliometrics are a range of quantitative measures that assess the impact of research outputs. Bibliometrics complement qualitative indicators of research

impact such as funding received, number of patents, awards granted and peer review. Together they assess the quality and impact of research. We can use bibliometrics to:

- Provide evidence of the impact of your research outputs when applying for jobs, promotion or research funding
- Find new and emerging areas of research
- Identify potential research collaborators
- Identify journals in which to publish.

Types of Bibliometric Measures

Here are some common bibliometric measures:

- **Citation counts:** the number of times a research output appears in the reference lists of other articles and books. Found in: Google Scholar, Scopus and Web of Science.
- **H-index:** designed to measure an author's productivity and impact. It is the number of an author's publications (h) that have h or more citations to them. Found in: Google Scholar, Scopus and Web of Science.
- **Field-weighted citation impact:** the ratio of citations received relative to the expected world average for the subject field, publication type and publication year. It can apply to a research output or group of research outputs. Found in SciVal.
- **Outputs in top percentiles:** the number or percentage of research outputs in the top most-cited publications in the world, UK, or a specific country. Found in SciVal.
- **Journal Impact Factor:** based on the average number of citations received per paper published in that journal in the preceding two years. Found in Journal Citation Reports.
- **CiteScore:** the average number of citations received in a calendar year by all items published in that journal in the preceding three years.
- **SCImago Journal Rank:** places a higher value on citations from more prestigious journals.
- **Scopus SNIP:** a ratio of a journal's citation count per paper and the citation potential in its subject field. The Scopus SNIP normalises citation rate subject differences. Found in Scopus.

Webometrics

Webometrics is the quantitative analysis of web phenomena, drawing upon informetric methods, and typically addressing problems related to bibliometrics.The science of **webometrics** (also **cybermetrics**) tries to measure the World Wide Web to get knowledge about the number and types of hyperlinks, structure of the World Wide Web and usage patterns. According to Björneborn and Ingwersen (2004), the definition of **webometrics** is:

> "the study of the quantitative aspects of the construction and use of information resources, structures and technologies on the Web drawing on bibliometric and informetric approaches."

The term *webometrics* was first coined by Almind and Ingwersen (1997). A second definition of webometrics has also been introduced, "the study of web-based content with primarily quantitative methods for social science research goals using techniques that are not specific to one field of study", which emphasizes the development of applied methods for use in the wider social sciences. The purpose of this alternative definition was to help publicize appropriate methods outside of the information science discipline rather than to replace the original definition within information science.

Webometrics includes link analysis, web citation analysis, search engine evaluation and purely descriptive studies of the web. Webometrics research has been conducted by both information scientists and computer scientists, with different motivations. Within information science, webometrics has expanded from its initial focus on bibliometric-style investigations to more descriptive and social science-oriented research. It seems likely that webometrics techniques will continue to evolve in response to new web developments, seeking to provide valuable descriptive results and perhaps also commercially applicable data mining techniques. There are three main appeals of webometrics in contrast to traditional bibliometrics. First, the web can be timelier than the ISI databases. A typical research project might get funded, conduct research, report findings and then submit articles to journals. The time lag between the start of the project and the publication of the results in a journal is likely to be at least two years. Second, web data is not standardized and so it is difficult to separate out the different types of publication. Third, although web data can be very timely, it can be impossible to find the publication date of a web page and so webometric results typically combine new and old web pages into one data set. Finally, web data is incomplete in several senses and in arbitrary ways. Comparing the

advantages and disadvantages of webometrics, it seems that it is unlikely to replace traditional bibliometrics but can be useful for several other purposes.
In short, Bibliometrics has changed out of all recognition since 1958; becoming established as a field, being taught widely in library and information science schools, and being at the core of a number of science evaluation research groups around the world. This was all made possible by the work of Eugene Garfield and his Science Citation Index. This article reviews the distance that bibliometrics has travelled since 1958 by comparing early bibliometrics with current practice, and by giving an overview of a range of recent developments, such as patent analysis, national research evaluation exercises, visualization techniques, new applications, online citation indexes, and the creation of digital libraries. Webometrics, a modern, fast-growing offshoot of bibliometrics, is reviewed in detail. Finally, future prospects are discussed with regard to both bibliometrics and webometrics.

Self-assessment Questions

1. Define bibliometrics and webometrics.
2. Discuss the difference between bibliometrics and webometrics.
3. What are types of bibliometrics measure?
4. Elaborate three main appeals of webometrics in contrast to traditional bibliometrics.
5. Discuss the limitations of bibliometrics.
6. Why webometrics studies were conducted in the presence of bibliometrics studies?

Activity

Visit any academic library and select an academic/scholarly journal and do its bibliometric analysis with the help of tutor.